



technology opportunity

# Cellular Reflectarray Antenna (CRA)

*A simple-to-install design for satellite and communications applications that solves the problems associated with traditional parabolic reflectors*



NASA Glenn Research Center invites companies to license a new concept design for terrestrial satellite dishes and communications systems. Glenn's Cellular Reflectarray Antenna has been developed and tested for use with next-generation Ka-band satellites, although it can be used with all bands of satellite communication. The design's flat, planar configuration all but eliminates the wind-loading problems associated with larger parabolic reflectors for dish systems. The technology also offers unique features that provide ease of installation and improved signal reception while deterring piracy and theft of subscription satellite services.

## Benefits

- **Simple installation:** Untrained users (even consumers) will find the installation friendly, eliminating the cost of highly skilled technicians and most service calls.
- **Flat, compact design:** The planar design helps avoid problems with wind catching that may impede signal reception, and it offers a more streamlined aesthetic and desirable look for residential satellite applications.
- **Improved signal:** Judicious choice of board material and dimensions as well as dual-frequency operation helps improve signal reception.
- **Security protection:** Operation only within a given geographic "cell" significantly deters piracy and efforts to steal signal from paid satellite subscribers.

## Applications

### **Broadband satellite communications**

- Residential and business entertainment and other broadband applications

### **First-responder applications**

- Emergency communications for disaster response and recovery situations
- Military applications

### **Back-up communication for large events**

- Olympics
- Concerts
- Conventions

## For More Information

If you would like more information about this technology, please contact:

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For information about other technology licensing opportunities, please visit:

**Technology Transfer and Partnership Office**  
**NASA Glenn Research Center**  
<http://technology.grc.nasa.gov/>

## Technology Details

### **How it works**

The CRA is a unique design that promises to usurp conventional parabolic reflectors. The word “cellular” in the title of the design refers to a geographic “cell” of operation. Specifically, the CRA is designed to receive satellite signals for next-generation satellite television and communications services within a specified geographic area, or cell. Each cell comprises approximately 1,500 square miles. The CRA for any given cell operates by being aligned with its index pointing to magnetic north with the surface of the CRA level to the ground. The flat configuration of the CRA design makes this orientation streamlined and simple. The cellular nature of the CRA offers inherent security because it will not operate beyond its designated cell space, helping to deter piracy of subscription satellite services.

In the example of a subscription satellite television service, a CRA would be provided to a subscriber in a kit that also contains a simple compass for alignment purposes. The subscriber requires knowledge only of magnetic north from the operation location, which can easily be ascertained using the compass. Once positioned, a collimated antenna beam in the direction of a geostationary satellite is formed using a circular polarization method unique to Glenn’s design. In addition, the CRA aperture can operate at two distinct frequencies due to the choice of substrate thickness and materials, enabling both reception and transmission of signals. The materials used enable interlacing of high and low bands while maintaining only one main antenna beam for strong signal.

### **Why it is better**

The Glenn CRA is a vast improvement over current dishes by its significant ease of installation. Traditional satellite entertainment systems require service calls manned by skilled technicians—a workforce that is increasingly expensive to hire, train, and maintain. In addition, these companies may lose customers to other entertainment

options if they choose to not wait for a serviced install. With Glenn’s CRA design, a satellite system has out-of-the-box set up using just a simple compass to align with magnetic north. This virtually eliminates the need for skilled technicians (except in the rare case of unforeseen and unusual installation or technical situations), saving up to \$200 per installation.

Another advantage of the CRA over traditional reflectors is that the design overcomes the shortcomings of traditional parabolic reflectors as they relate to next-generation commercial satellite television and Internet markets. Whereas parabolic reflector antenna systems are bulky, unsightly, and difficult to install, Glenn’s CRA design features a flat shape that is inconspicuous and aesthetically pleasing, especially for residential applications. In addition, the planar shape of the CRA provides important robustness and reliability compared to parabolic systems by avoiding the wind-loading performance issues that often plague bulkier antennas during even light wind conditions.

Finally, Glenn’s CRA design offers the advantage of providing anti-piracy and anti-theft protection due to its cellular nature. While traditional antenna systems are relatively simple to gain unauthorized access to, the CRA is a sophisticated system with a specific operating range such that only highly skilled pirates would be able to steal a signal from the antenna.

### **Patents**

NASA GRC is seeking patent protection for this technology.

### **Licensing and Partnering Opportunities**

This technology is part of NASA’s Innovative Partnership Program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to inquire about the licensing possibilities for the Cellular Reflect Array design (LEW-18248-1) for commercial applications.